

IN THE CLAIMS

Please amend claims 1-5, 8, 10-14, 16, 17, 19, and 20, and cancel claim 9, as shown below. Pursuant to 37 C.F.R. § 1.121(c), the text of all pending claims, along with their current status, is set forth below.

1. (Currently amended) A method of managing task execution in a storage system comprising:

measuring a parameter indicative of workload of an interface to a storage
system ~~workload~~; and

assigning priority of tasks executable on the system based on the measured
parameter, wherein assigning comprises assigning to individual tasks
an allowable utilization value at which the individual tasks are
authorized to execute, wherein the allowable utilization value is
indicative of importance of the task and correlative to the parameter.

2. (Currently amended) The method according to Claim 1, wherein the parameter
comprises host input/output operations per units time, and wherein measuring the
parameter comprises further comprising: counting a number of the host input/output
operations per unit time as the parameter indicative of workload.

3. (Currently amended) The method according to Claim 1, wherein the parameter
comprises further comprising: measuring interface bandwidth utilized as a proportion
of interface bandwidth capacity as the parameter indicative of workload.

4. (Currently amended) The method according to Claim 1 further comprising:
~~assigning to a task a maximum allowable utilization value at which the task is~~
~~authorized to execute;~~
maintaining a queue of tasks, the individual tasks having the assigned
~~maximum~~ allowable utilization values;
measuring the parameter to obtain a current utilization value;

querying the tasks on the queue in the queue order;
executing a queried task that has an assigned ~~maximum~~ allowable utilization
value higher than the current utilization value; and
deferring to a next task on the queue, if any, for a queried task that has an
assigned ~~maximum~~ allowable utilization value lesser than the current
utilization value.

5. (Currently amended) The method according to Claim 1 further comprising:
maintaining a plurality of task queues including ~~a task~~ the queue that bases
execution on assigned allowable utilization and measured utilization,
and at least ~~one task~~ a second queue with a priority that differs from the
~~utilization based queue that is based on assigned allowable utilization~~
and measured utilization.
6. (Original) The method according to Claim 1 further comprising:
maintaining a high priority task queue for queuing and executing, in the queue
order, tasks assigned a high priority; and
maintaining a utilization task queue for queuing and executing tasks, when the
high priority queue is empty, in an order based in part on the order of
queuing and in part on assigned allowable utilization value of a task
and a measured current utilization value.
7. (Original) The method according to Claim 1 further comprising:
maintaining a data structure associated with a utilization task queue indicative
of allowable utilization of all tasks on the queue; and
executing or deferring execution of all tasks on the utilization task queue based
on the data structure and a measurement of current utilization.
8. (Currently amended) An array controller comprising:
[[an]] a physical interface capable of coupling to a storage array; and

a memory comprising control logic; and including code executable ~~[[on]]~~ for the control logic comprising:
a performance measurement utility that measures a parameter indicative of storage array input/output (I/O) workload; and
a task management utility that assigns priority of tasks executable on the storage array based on the measured parameter, wherein each task is assigned a value of the parameter at which the task is authorized to execute if the measured parameter value is below the assigned value, wherein the assigned value is indicative of a priority of the task; and
a queuing utility that maintains a task queue and processes the tasks based at least in part on the assigned values and the measured parameter values.

9. (Cancelled)

10. (Currently amended) The array controller according to Claim ~~[[9]]~~ 8, wherein the parameter comprises a state of utilization of the I/O, and the assigned value comprises a threshold utilization, and wherein the task management utility operates in combination with the queuing utility and the performance measurement utility to: maintain a queue of tasks with each task assigned ~~[[a]]~~ the threshold utilization; ~~[[.]]~~ periodically measure current utilization; ~~[[.]]~~ and execute tasks on the queue in the queue order so long as the current utilization meets the task threshold utilization.

11. (Currently amended) The array controller according to Claim 8 wherein the parameter comprises ~~performance measurement utility measures a performance criterion selected from among a group consisting of number of host input/output operations per unit time, interface bandwidth as a proportion of bandwidth capacity, disk busy, disk transfers per second, kbyte throughput per second, number of~~

input/output operations per time interval, ~~[[and]]~~ or input/output wait percentage, or any combination thereof.

12. (Currently amended) The array controller according to Claim 8 wherein:

the executable code further comprises a queuing utility that maintains a plurality of task queues including ~~a task~~ the queue that bases execution on assigned values and on the measured ~~parameter utilization~~, and at least ~~one task~~ a second queue with a priority that differs from the ~~utilization based queue~~ that is based on assigned values and on the measured parameter.

13. (Currently amended) The array controller according to Claim 8 wherein:

the executable code further comprises a queuing utility that maintains a high priority task queue for queuing and executing, in the queue order, tasks assigned a high priority, and that maintains a utilization task queue for queuing and executing tasks, when the high priority queue is empty, in an order based in part on the order of queuing and in part on the assigned ~~allowable utilization~~ value of a task and the measured parameter comprising a measured current utilization value of I/O of the storage array.

14. (Currently amended) The array controller according to Claim 8 wherein:

the executable code further comprises a queuing utility that maintains a data structure associated with a utilization task queue indicative of assigned values comprising allowable utilization of all tasks on the queue, and that executes or defers execution of all tasks on the utilization task queue based on the data structure and a current measurement of the parameter comprising current utilization.

15. (Original) The array controller according to Claim 8 wherein:

the storage array is a Redundant Array of Independent Disks (RAID) array in a structure selected from among RAID0, RAID1, RAID2, RAID3, RAID4, RAID5, RAID6, RAID7, and RAID10.

16. (Currently amended) An array controller comprising:

[[an]] a physical interface capable of coupling to a storage array; and
a memory comprising control logic; ~~and~~ including code executable [[on]] for
the control logic comprising:
a performance measurement utility that measures a parameter indicative of
storage array input/output (I/O) workload;
a queue manager that maintains a task queue of tasks assigned a I/O workload
threshold value, wherein the threshold value is indicative of priority of
the task; and
a task management utility that executes tasks acting on the storage array with a
priority based on the storage array I/O workload parameter and the
order on the task queue.

17. (Currently amended) The array controller according to Claim 16 wherein the queue manager maintains a high priority task queue for queuing and executing, in the queue order, tasks assigned a high priority, and that maintains a utilization task queue for queuing and executing tasks, when the high priority queue is empty, in an order based in part on the order of queuing and in part on the assigned I/O workload threshold allowable utilization value [[of]] to a task, and on a measured current I/O workload utilization value of the storage array.

18. (Original) The array controller according to Claim 16 wherein the performance measurement utility measures a performance criterion selected from among a group consisting of number of host input/output operations per unit time, interface bandwidth as a proportion of bandwidth capacity, disk busy, disk transfers per second,

kbyte throughput per second, number of input/output operations per time interval, and input/output wait percentage.

19. (Currently amended) An article of manufacture comprising:

- a controller ~~usable~~ comprising a computer readable medium having a
computable readable program code embodied therein for managing
task execution in a storage array ~~comprising~~, the computable readable
program code ~~further~~ comprising:
 - a code capable of causing the controller to measure a parameter indicative of
storage array input/output (I/O) workload comprising a sum of
utilization of an I/O device;
 - a code capable of causing the controller to assign priority of tasks executable
on the storage array based on the measured parameter; and
 - a code capable of causing the controller to maintain a queue of tasks with each
task assigned a threshold utilization, wherein the threshold utilization
is indicative of importance of the tasks.

20. (Currently amended) The article of manufacture according to Claim 19 wherein the computable readable program code further comprises:

- ~~a code capable of causing the controller to maintain a queue of tasks with each~~
~~task assigned a threshold utilization;~~
- a code capable of causing the controller to periodically measure current
utilization; and
- a code capable of causing the controller to execute tasks on the queue in the
queue order so long as the current utilization meets the task threshold
utilization.